NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dinner Meeting Space Research Group

Harvard Lecture, Questions & Answers

with

MR. BEGGS

October, 1981

(Transcript prepared from

tape furnished by Agency.)

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1330 VERMONT AVENUE, NW
WASHINGTON, D.C. 20005
(202) 234-4433

MR. : This is a dinner meeting of the Space Research Group, which is a Harvard University group, and the other one is the Harvard Student Branch of the American Institute of Aeronautics and Astronautics, which has national affiliation.

The other members of the group that are present are Bart Cosman. He is the Editor of our newsletter, which hopefully, which incidentally -- for attending this dinner you are going to get a complimentary one-year subscription to.

We hope to make that a good journal eventually so you will be getting that regularly, and Rebecca Hemmelhuch is in the back, and she is our Library Coordinator, and keeps us in touch with the Space Group.

I would just like to say thank you for coming, and I have one small announcement that might be of interest to people here is that there is a group of people in California who are associated with the Company, Delta B, Inc.

I don't know if any of you have heard about it, but they're presently putting together an investment package that -- for privately funded missions to Haley's Comet. This has been cut out of the national budget, and looks like their money is

available, and so that fits in right along with the --

(Laughter.)

I would like to introduce our speaker, Mr. Beggs.

(Applause.)

MR. BEGGS: Thank you very much. I do -- I wish them success. I would be delighted if we could get a Haley's. Wish there would be two Haley's missions, but not as hard as the work. We should have started a couple of years ago if we really wanted to go in a way that would yield a good scientific mission.

I hope they can put that together. It is kind of nice to be here on such an auspicious day -- another Nobel prizewinner -- that is a nice thing for me to come at that particular point in time.

It is also, I think, a time for both reflection and looking forward, and I would like to just spend about ten minutes worth of that with you tonight, to talk about what we have done, and maybe look forward to what we might do in the future.

NASA has been in existence for a little less than a quarter of a century -- 23 years to be exact. Of course, its predecessor, ~~He~~ Agency was in existence for a long time before that -- 67 years -- since 1915.

We basically do the same thing as ~~we did~~ that NACA did before us like coordinating government, industry and ~~in doing~~ important projects in aerospace and outer space. We have done great things together.

We have in the last 20 ~~some~~ years done some pretty amazing things, ~~such as~~ went to the Moon, explored most of the planets and we hope will explore all of them, ~~or at least Voyager one will fly close to Pluto, so we would have explored all of them~~ by the end of the decade.

We have developed and we lead the world in development of advanced aircraft. In the process we've helped to further American science and technology, and we've grown to a state of excellence -- envied by the rest of the world, and indeed, unchallenged by the rest of the world, except recently.

That competition which we're facing today is largely based upon our experience in space, which duplicates the kinds of things we set up in order to make ourselves pre-eminent in space and aeronautical science.

We are now entering a new age, a new era with the launching of the first space shuttle. We have the means of doing even greater things in space.

We've proven the space shuttle concept is sound, and in the next year, a ~~lot of~~ following 3 the other developmental flights, ~~we've opened up the flight envelope to the shuttle, and~~ we will show that we can do all of the things that was ~~critical before~~ predicted it.

We will be able to orbit space laboratories, and we will be able to carry out experiments in industrialization ~~in space, merchantization~~ and Commercialization in space. We will be able to develop large space structures for communication purposes -- potentially for the development of space stations which may take us back to the moon and even to Mars, and we may even be able to do some things that all of us sitting here tonight -- although I am sure that these young men and women sitting here tonight probably can envision them, but things we have not envisioned before.

It has been and continues to be an important part of NASA policy to involve the universities in our program. From the beginning in 1958 until the present day we have considered the university involvement as being a very important part of the program.

The most important part of that to me is the involvement of ~~the~~ young people in the space program. Because without them we cannot go further with the program, and unless we get them interested, the program will

eventually come to an end.

In 1959 NASA grants to academic institutions was nearly $3.6 million, a very small amount of money. Over the next several fiscal years it jumped to more than $80 million and in 1966 we reached the peak of our funding at university research and academic grants, which amounted to well over $120 million.

In 1966 there was another peak I might add and that was the peak of the Apollo program, in which we spent just about $6 billion in pursuing a program of moon exploration, space science, planetary exploration, applications and aeronautics.

If we had, in buying power, today the $6 billion we had in 1966 it would amount to about $16 billion in 1982 economics. Instead of that we have got about $6 billion -- so we have less than half -- and our buying power is diminished accordingly.

When a lot of the scientists and some academics have come to me and suggested we should spend more money in their areas, I remind them that we are spending today about the same percentage of our current budget that we spent back in 1966 with the various interest groups.

If you look at that I think you will find that to be true. We tried to spread the

money in the same way that we spread it in those Halcyon years of Apollo.

What that says to me is that if you sell a total space program with a strong national objective, there are more resources for everyone. Now much of the money that we spent with the universities is left to the establishment of research facilities, institutions and so forth, but a lot of it -- in fact most of it -- went to funds specific research projects -- research grants and the development of instruments and uses the research to go on our satellites and our space -- manned spacecraft.

Over the years Boston has done very well from this program. The largest of the institutions that have participated in the program is, of course, MIT, right down the street, but Harvard has benefitted very substantially as well. to the program, and as a matter of fact if you add up all the money -- you come up number eight on the list of all those institutions which have benefitted by the grants that NASA has made and the participation of the various scientific programs that we've conducted.

There was another part of the program, I will remind you, that had to do with university assistance. That program, which is called the Sustaining University

program went from 1962 to 1971 and its purpose was to increase the supply of scientists and engineers in space-related science and technology in order to meet the growing needs of the government space research program.

That program trained over 5,000 scientists and engineers, primarily at the doctorate level, but also helped to fund a number of master and baccalaureate degrees.

Those graduates and we recently ran a survey on those graduates. -- numbered 4,000 of them -- that was all of them we could trace, and it is not too bad. We can trace 80 percent of them or about 4000. Forty-four percent of them are still around in the universities or spent at least the majority of their careers in the university; 44 forty-four percent went into industry and are still in industry, and have spent the majority of time in industry. Seven percent are in the government. That is a pretty good payoff. The remainder, that doesn't quite add up to 100 percent for those mathematicians there -- went into post-doctoral training and are still doing research work at one level or the other.

In 1971 the Sustaining University Program was cancelled, and the national priority that caused a cancellation, I think, are a matter of record to all

of us, but they largely reflected the dwindling NASA appropriations and the fact that we did not have the constituency in the Congress to sustain that program.

I can think of no more important program than that sustaining university program. It bothers me that it was eliminated in 1971, however, the total program was not eliminated in that we continued to give scientific grants that we have given and supported the training of our young people into doctoral and post-doctoral training levels.

We will continue to do that. While the total amount of money we are spending these days is down from those days when we put $120 million into the program, it is still something like half of that.

Over the years, we have put a fairly consistent one percent of the budget that we have received into the university grant program. Now that may not be enough, but at least we've been consistent, and it may be that that consistency is the hobgoblin of little minds that we've had a lot of those little minds wandering through and it has worked out to be just that way.

(Laughter.)

In the future I can assure you that that

form of support will continue, and I hope that during the short tenure I'll have in this (because rarely does an Administrator stay around for more than four or five years), that I am going to try to reverse the trend and turn it up a little bit.

We have many opportunities for the university community to participate with us. In 1983 the European Space Agency's Spacelab will be placed into orbit, and as you know that laboratory was designed primarily to provide a unique setting for many experiments, will provide the opportunity for all of you to participate in the very important activity of putting man into space through experiments and do useful work to find out just exactly what we can get out of a system like shuttle.

We hope to get massive student involvement in that. As a matter of fact it is my hope that by the latter part of this decade ~~you~~ we will be flying some students up to spacelab, and having them conduct their own experiments in ~~this~~ the unique environment of ~~the~~ spacelab itself.

For that purpose we've made it ~~cheap~~ relatively economical to get into that program, and the grants that we will be giving to universities to conduct their work will make it easy for you to get from here to there.

In addition ~~to that~~ we have, of course, ~~made it available~~ made the shuttle available on what we hope are easy financial terms ~~where~~ we've put ~~on~~ out in another program, what we call "the get-away special", ~~that~~ which anyone who wants to put an experiment on a space-available basis on the shuttle can do so for a very modest sum of money.

There are a lot of people taking advantage of that and we hope more will. We are entering a very, very difficult financial time. The NASA budget, which is still in terms of total size, quite large, is spread over the program, which is very large, in a way that perhaps has gotten us to the point where we cannot sustain all of the programs in the manner that makes them worth the effort.

In some areas the gain is no longer worth the gamble. I f we cannot convince the Congress, and if we cannot convince this Administration that they should put up enough money to sustain the balance of programs we have, we simply will have to eliminate one.

And much ~~Most~~ of what you have been reading in the press is related to just that issue, ~~which~~ It is that you can't spread the money in such a thin layer that you ~~are~~ would not doing good work in any of ~~them~~ our programs. I do not

believe that this country has come to that point. It is not my purpose to come to NASA to eliminate any of the major programs that we conducted so successfully.

It is my belief that this program will be funded to a degree that will sustain all programs, and indeed, I hope to reverse the trend and put more money back into the program, which I consider most important, and that is the Sustaining University Program.

If we are to do that it will require the strong help of all of you at this table. It will also require that we do more than we've done in the past in convincing not only our friends in the Administration, but also the Congress and the public-at-large that we are doing good work.

There are a lot of good signs, most of the public polls that have been taken in recent years suggest that the public, and I, as a businessman kind of look at as stockholders -- are very much interested in the program again.

The recent Harris poll suggested that over 60 percent of the American people considered it an investment well-made. We must continue to educate and we must continue to tell them of the good results that come out of the program, and that takes work.

Our capabilities and opportunities were never greater. With the advent of the shuttle and the advent of all of the other technologies which we have built in the last 20 years -- the only questions is how we can exploit the capabilities and the opportunities to the fullest.

Perhaps that answer comes from a quotation from Thomas Wolfe, who wrote in the "Web and the Rock", "If a man has the talent and cannot use it, he has failed. If he has the talent and uses only one-half of it, he has partly failed. If he has a talent and learns somehow to use the whole of it, he has gloriously succeeded and won a ~~The~~ satisfaction and a Triumph ~~the brial of~~ few men ever know."

It is worth thinking about.

Thank you very much.

(Applause.)

MR. : I would just like to thank you all for coming and we are going to have more speakers in the lecture series in the coming year, and --

(PUBLIC LECTURE) (Side two of tape)

MR. BEGGS : It is very nice to be here, and thank you for that introduction. Scott called me ~~in the~~ and said from city of Wichita, Kansas, which all of you in the aerospace industry know is the source of all that

is good in the general aviation business. I could not refuse ~~its predecessor aeronautics for quite [illegible] of years before since 1950,~~ I am delighted to be back in Boston, which is the source of many happy memories. You are privileged here to have at your beck and call all of the great intellectual stimulation that exists in this country ~~time that the earth and [illegible] other planets revol around the Sun.~~ I am particularly glad to be here on a day that is so auspicious in that we announced yet another Nobel Prize winner, and I think that just a few years ago the United States used to sweep all of the Nobel prizes. We get all of our share as it is, today, but is always nice to be reminded that we're still right up there on the cutting edge of technology still doing fine things in science that are recognized by the rest of the world.

~~birth some~~ As my friend Shakespeare said ~~someone said~~ -- I agree, I should not be a man who draws out the threat of his verbosity -- ~~and~~ -- finer than the staple of his arguments, so I am going to speak, I hope, for a relatively short time, and leave some time ~~at least~~ in time for you to ask questions.

~~to anyone that~~ I would like to start by reviewing where we've been. NASA has been in existence for less than a quarter of a century, 23 years to be exact, although

although its predecessor Agency

its predecessor, NC was exploring the depths of aeronautics for quite a number of years before that, since 1950, but we have done many things.

Four-and-a-half centuries ago Copernicus took the giant step to end the human race's isolation in the universe by arguing convincingly for the first time that the earth and the other planets revolved around the sun.

It was then a revolutionary concept that gradually led us to challenge the notion that we are of unique intelligence in the universe. Today there is a growing consensus of scientists that there must be intelligent life in words beyond the solar system.

This consensus exists because what we have learned about the physical universe, from its birth some ~~50~~ billion years ago or so, and by no means do we know all there is to know about the chain that connects the first instance of this universe, its evolution, formation of matter, the galaxy, stars, solar system, planets and so on and so on, but we are learning so fast, and it will come to no surprise to anyone that much of what we have learned, indeed, ~~boast~~ most, has come about over a relatively short span of less than a quarter-of-a-century, which just happens

to be a period since the United States decided to go into a program of exploring and expanding its knowledge of space.

Many of you are probably familiar with that old Chinese proverb, "A blessing or a curse", which goes "May you live in interesting times." All of us, I believe, would agree that as far as space exploration is concerned, we have been living in particularly interesting times.

Over the past couple of decades 12 men, all Americans, have walked on the moon, ~~and~~ our instruments explore many of the planets in our solar system, starting with the terrestial planets, and now ~~of~~ expanding out ~~the other~~ to more new planets in the outer part of our solar system.

By the end of this decade we will probably have visited all of -- or at least gone by all of them because Voyager I will pass by at least within a Harley distance of Pluto, and we will have seen the extent of our solar system and gone beyond the point of the influence of our small stars, the sun

Our powerful radio telescopes search the heavens for knowledge of cosmic events, ~~and~~ we discovered in the last few years such phonemena as series of black holes and the energetic Quasars.

We have built an air station, weather, navigation, resource and many other types of satellites that have brought untold benefits to the earth, and we are currently building and testing a space shuttle which will, for the first time, give is routine, reliable and, we trust, economic transportation to and from space when it goes operational next year.

More specifically, since 1958 when the United States launched its first satellite, Explorer I, NASA has had 29 successful manned missions and 282 successful unmanned missions into space.

This, of course, include planet to earth, earth orbit and lunar missions. The interplanetary spacecraft, Pioneers, Viking, Voyagers, have visited Mars and orbited Venus.

Now they have crossed the asteroid belt and encountered the giant planet Jupiter, and just lately, Saturn, and now moved on to fly by Uranus, and perhaps Neptune. I believe we will see Neptune by the end of the decade, and as I said earlier, we will come within Haley's distance of Pluto and that is all there is as far as we know -- of this planetary system, this giant galaxy -- a lot of other galaxies.

We have not limited our investigations to planets. We continue to study (unaudible) --

Solar missions are revolutionizing our understanding of the sun, and its activity, and how it affects weather and climate trends on the earth.

What we are learning from all this activity is how to better understand the universe, and how life, matter, energy, indeed, how the universe began.

The next step will come as we start to use this truly revolutionary new space shuttle system. With the shuttle we could put larger payloads into space, and we can, in addition, start to talk about continuous land operations in space, like constructing large space stations and other large structures.

We can perform preliminary tests on satellites before releasing them into orbit -- a very cost-saving feature. We can launch several satellites in one mission, which would reduce launch costs from the cost and operation of any specific system.

Beyond those capabilities the shuttle will give us an opportunity to continue and study and enlarge our view of the solar system, the galaxy and the cosmos.

The first of those major new missions is Space Telescope. In 1985 we will carry into orbit a very large astronomical instrument which will open

up to us a picture of the universe that no man on earth has ever seen.

Unimpeded by the atmosphere and far above dust and pollution, the new telescope will give us a view of the universe that will keep the astronomers busy rewriting text books for years to come. Indeed, I expect it will raise many more questions than it will answer.

With the Space Telescope, we believe, will peer perhaps to the edge of the universe or at least some 14 billion light years away. We'll see the stars and the galaxy and perhaps see the light from the original big bang or whatever caused the universe to begin.

We will be able to see objects that are 50 times fainter and seven times further away than ever seen before. Everyone, scientists and laymen alike believe that this will give us the kind of knowledge that man has dreamed of since first Copernicus described us as but a small planet rotating around the small stars, and a relatively medium size galaxy in a vast universe.

Our galaxy, as you know, is one of only 100 billion galaxies. Through new mechanisms that we are just learning to come to grips with, there are

ways that we can start to look at our nearby stars to find out whether they do, indeed, have a planetary system like our own.

We will be able to deduce, if we construct the instruments whether the stars are accompanied by planetary objects of ceteris matters or larger. We are developing that technology now. What we have learned from all of the instruments we have launched to date, first two decades in space that is, are but a prelude to what we will learn in the next few decades.

The launches of these great -- from shuttle and comparative study of the solar system body will enable us to continue to advance our knowledge and to better understand where we are and how we fit in to a very much larger system of the cosmos.

We are learning. There are many more mysteries that have yet to be explored. Venus, our closest neighbor which should, as we all know, look much like ourselves, has a surface temperature of 900 degrees F.

How that came to be, why it came to be still needs exploring and if we proceed with our program we will have an orbiting system around Venus by the end of this decade. We will be going back to Jupiter again with our Galileo mission again to be

launched around 1985, and if we start to understand what is happening in the primordial planets, the outer part of our solar system, we will undoubtedly come to grips with how we came to be and why it was that the innermost planets are so much different than the outermost, and how the origins of the solar system made this system so different from planet to planet.

In about two years we will be launching an orbiting laboratory, ~~our own~~ known as Spacelab. This is a product of our cooperation with the European space community.

That laboratory, again to be buried in the shuttle's cargo bay will allow scientists to work in a shirt-sleeve environment in space from seven to 30 days at a time.

And I would hope that many of you in this audience who are interested in space, would have the opportunity to go up with shuttle and to work in that space laboratory, and that is not a far-fetched proposition.

The trip up in shuttle is a rather benign trip. The highest acceleration you experience -- is a little less than 4 "g's", so it is not beyond the pale idea that we will be flying perhaps four to six scientists up to work in the space laboratory each time

we go and I should remind you that in about 1986 we will be flying every two weeks.

You will be able to conduct experiments in the micro-gravity, near-vacuum and vacuum and contaminate-free environment in the space lab. There are many things that we can learn. The potential is enormous ~~the~~ for processing ~~of~~ new types of materials and the one that (~~inaudible~~ interests me) the most is the one we have signed up with McDonnell Douglas and the Johnson-Johnson subsidary, the Orbital Pharmaceutical Company, to conduct experiments on a continuous ~~low electro (inaudible)~~ flow electrophoresis, --

The prospect is to produce new and dramatically different types of pharmaceuticals in space which is a unique and great opportunity, because they have high value, low cube, low weight, but there are many other experiments and the number only limited to the imagination of man.

The shuttle ~~area~~ era that has opened that door to expanding activities. On November 4 we'll be flying the second of the developmental flights of shuttle. The reason why we're flying four, of course, is that we must understand how to operate this vehicle within the total flight environment, and flight envelope of the shuttle.

On that we'll be carrying some experimental items, ~~I believe,~~ not the least of which gives a new synthetic aperture radar, -- looks down on the earth's typography and start ~~and start~~ to understand a little better how we can define the area where resources, mineral resources, petroleum resources, ~~controlling~~ resources exists on the earth's surface; -- to define better how we can manage the water resources of our small planet, and to look a little more at what we can do with the global information system.

We have over the last 20 years designed and developed and are now into commercial operation with a number of applications that have flown out of the effort we put in through the last 20 years.

My belief I ~~believe it~~ is the application of satellite ~~and~~ technology are just beginning to the shuttle will make a great deal easier to put new satellites into orbit. It will also enable us to go out and go up and prepare them on orbit and improve them on orbit -- ~~add~~ to them as time goes on -- to learn from what we get and then to improve.

Such systems, without any questions, will improve our standard of living on earth. They will also, without any question, raise a number of new and exciting possibilities.

would be the construction of [illegible] in

As I look ahead we will undoubtedly see geosynchronous orbit.
worldwide weather forecasting on a continuing basis.

The mirror would [illegible] --
We will see navigation satellites moving into world
stretched over a mile wide [illegible] striking
air traffic control. We will not -- without any question
this mirror could be [illegible] focused / variety
as we go toward man in space operations on a continuing
of uses -- either to impact [illegible] cultural
basis in space, learn how to develop many new and
activity needed modification [illegible] ification
exciting systems.
of weather.

That space station which is the next logical
We have been, for [illegible] nation
step -- as a matter of fact if you look back at the
of explorers and entrepren[illegible] need,
origins of our planning for a shuttle system, we
the new frontier. It is my [illegible] hallmark
said we had two things in mind. One was efficient, routine
of a great nation -- is to [illegible] the
economical transportation together with a space
unknown.
station which provides for a continuous manned presence
This nation has alwa[illegible] it needed
in space.
a frontier. Space is, and alw[illegible] that frontier.
The next logical expansion of our activities
It is in our destiny, I beli[illegible] to
is that station. Once the station is built, our
discover new knowledge, to [illegible] s and
potential to exploit will be almost limited. We will
to use them as a means to [illegible]
begin to learn how to construct large structures
[illegible] we move [illegible]
in space which allow the generation of power for use
we are at a stage where we [illegible] use
in that space station, and for use of all of the
Century in almost any new t[illegible] into --
experiments that come up.
we will have to think ab[illegible] the
It would allow us to construct large antennas
surrounding planets.
for communications. Another possibility that will
down the street [illegible]
require some study, and I am sure that the most
massive environmental impact statement ever constructed

would be the construction of a large mirror in geosynchronous orbit.

The mirror would consist of (inaudible) -- this mylar reflective film stretched over a hoop, a mile wide or so. Sunlight striking this mirror could be focused on earth for a variety of uses -- either to impact areas where agricultural activity needed modification or even to the modification of the weather.

We have been, for two decades a nation of explorers and entrepreneurs. It is, indeed, the new frontier. It is my judgement, the hallmark of a great nation -- is to continue to explore the unknown.

This nation has always felt that it needed a frontier. Space is, and always will be that frontier. It is in our destiny, I believe, to explore, to discover new knowledge, to build new products and to use them as a means to better our lives.

As we move into the 21st Century, now we are at a stage where we are looking at the 21st Century in almost any new thing that we enter into -- we will have to think about what we do with the surrounding planets.

Down the street here at MIT, Dr. Henry Cole was talking about mass drivers (~~phonetic~~) -- other

Deals with field of robotics.

MIT work and work here at Harvard (~~inaudible~~) as we move into the space station in lower orbit and then move that space station out to a geosynchronous orbit, the next move is to go back to the moon and perhaps (~~inaudible~~) to mine the resources of the moon.

Robotic (~~phonetic~~) factors on the moon from a geostationary space station, using robotic technology developed in the next 20 years, will allow us, I believe, to advance to self-replicating robots, which could mine the moon, return those resources to the space station for the building and further exploration of the solar system.

Beyond that as you move out perhaps 50 years, we can now provide the same kinds of robots, self-replicating machines on the surface of Mars, followed perhaps by manned colonies, first on our lunar surface and then on Mars.

Such activities are not far-fetched. They are well within the technology we have today. as we look back 20 years to think of all that has happened from 1958 to 1982, what might happen --

(End of tape.)

You have the interest, the desire and if you want to use this program to see this country advance and progress, the opportunity has never been

greater.

We must continue to build on what we've got. We cannot stop. We must expand the research and technology base, and we must use it in such a way that would benefit mankind.

If we make that our common resolve, we can do much more than any of us ever dreamed.

Thank you very much.

(Applause.)

QUESTION PORTION

MR. : Yes?

MR. : (Inaudible) -- (Applause)

MR. : Is this thing on? First of all you have a number of very strong supporters for the continuation of the planetary program and even, indeed, the current Administration -- the -- let me go back to the beginning and look at the NASA budget starting back to days of Apollo.

We were spending a little less than $6 billion in 1966, and extent of that budget in 1982 economics would be like $16 billion instead of $6 billion from Congress.

If you take that as perhaps an aberration and go up to 1972 when we began the shuttle project, the NASA program was about $3.4 billion, and you

extend that to 1982 economics, that would be about $7 1/2 billion -- about 20 percent below where we were and what was considered to be a stable kind of resource.

Now your perception on the OMB is not correct, and I am speaking of your gag -- talking about budgetary issues. It ought to be, as Bob suggested, if we do any of the things, that you suggested -- and as a matter of fact many of you have who've served in Washington know that they don't offer it that way.

They will from time-to-time suggest you cut your budget to ribbons and say "You do it", but rarely do they come to you and say, "Shut down the space network and cut off all your planetory exploration and do all those bad things".

They know there is political implication, and that would be very bad. So they haven't suggested that, nor, indeed, have they landed on the space program in what I've described as --(inaudible) -- looked at the budget of NASA as it was configured by the new Administration once they got in town and started making budget cuts -- could have been almost any other agency in town.

Indeed, even if you look at it compared with the research and development budget of the Department of

Defense, they (inaudible) -- we find we did well even in comparison to that.

We have not been particularly (inaudible) -- in this budgetary process. Now all that having been said is not to say we don't have problems. We have very big problems.

Those problems reflect the earlier statement that I made that our budget, in terms of buying power, has come down significantly over the last ten years. If you look at the planetary program as a percentage of the total budget we have, the percentage has been constant for about ten years.

We're putting the same percentage of the budget in planetary but the trouble is that the total is so much smaller, so what that buys is a much smaller program, and we've got to wrestle with that. If you look at the budget as a whole, there comes a level in that budget where you cannot sustain the balanced program that we've sustained over the last 20 years of the NASA program.

That balanced program of manned spaceflight, the planetary and space sciences, application and aeronauticals -- those four things the Congress told us to do -- as a matter of fact some of the wives of the professors of this particular institution helped

draft that legislation and that is the balance they brought into it.

At some level in the budget it no longer becomes possible to do all four of those things, so you have to, at least, do all of them in a way where they really are worth doing -- so you have to eliminate one.

If we are put upon by the OMB or Congress to reduce much further from where we are, I think we'll be in that position. So far they haven't asked us to do that, so I think for the moment it is safe.

The large space telescope is safe. That should not make you doubtful, however -- to answer the last part of your question, what you are doing in the various societies, associations which are trying to get the perception across to the Congress, to the Administration -- the program is important, very important because you are our public.

I am very much encouraged by the fact that the general public at large seems to be coming back to the realization that what we are doing is important. Well over half of the public believes we should be spending at least as much as we're spending and 40 percent is a large percentage -- and they believe we should be spending more. That is a high percentage.

I probably didn't answer the whole question, but that was on purpose.

(Laughter.)

Yes?

MR. : (Inaudible) --

MR. : The problem I have in NASA, almost all of us associated with the agency are in here to die (inaudible) --

MR. : My view of that from where I sit in Washington is that there seems to be a renewal, if you will -- I think there's a lot more interest in coming around and doing the good things that need to be done.

In the last several years -- the previous ten -- the -- I think the public interest in the space program and the fact that there is a realization that this country has been living off its capital in a lot of respects is starting to be a general realization -- in the last election campaign, which was really a part of the debate -- science and technology, research and development, competitiveness in the world -- and the fact that (inaudible) -- the realization that the rest of the world is starting to beat fairly effectively across the board -- the realization that we lost our dominant competitive position in a lot

of industries -- the realization that the way you maintain that competitive position by conducting a very vigorous program of research and development --

The industries that we compete favorably with the rest of the world are basically those industries which have been favored by the kind of research we've been doing and such programs as NASA -- sibernetics, aeronautics, solid state electronics, solid state physics, medical electronics, all have benefitted by what we've been doing the last two decades and the utilization is starting to dawn on people.

You have to continue to work if you want to compete, but the rest of the world is coming fast, and from that sense of our technology, we publish everything, and I think that is good. I would not want to do it any differently.

We've given to the rest of the world access to our technology free, and I think if I had to do that over again I would do it a little differently.

(Laughter.)

But I would not want to try to shut off the flow of technical information. I think there is a growing realization that we need to stay ahead of the rest of the world -- we see them coming back -- the Japanese, the Europeans.

We no longer have a monopoly in space. Europeans and French now have a launch vehicle and are offering launch services at very good prices -- they're subsidizing as far as I can see, and that is going to be a competitive prospect for shuttle in the next several years.

They're in the communications field, and they're going to come with an earth resources satellite. The Japanese similarly have come into communications satellites, and are working very hard with respect to (inaudible) --

In short I think we have got to look to a lot of things -- perception -- rather then delaying -- tough old world out there. Pull in our belt and do all the good things so as to stay ahead.

We're capable of doing them.

Up in the back?

MR. : (Inaudible) --

MR. : Let me preface my remarks to that one by saying that the space program is at a linkage -- to use a currently popular word around here -- is at a linkage with national defense ever since the beginning.

The expendable launch vehicles that came out of the defense program were adapted in expendable

launch vehicles that came out of the best programs -- with their ballistic missiles program. We applied them as launch vehicles for spacecraft and as we developed those launch vehicles, the spacecraft that we moved had in some respects, some cases, some military application.

Military flew their spacecraft on launch vehicles and we developed further along with their ballistic missile technology.

From the beginning the shuttle has had three purposes. One is to fly government-type payloads, which are primarily space science and some applications, Metsas (phonetic) -- earth resource satellite and so forth.

Those are bought and paid for by the federal government although we do get some contribution from state and local jurisdictions to the applications. Third, there were the -- purely commercial type satellites and wherever -- from the communications satellites to people who wanted to try out new technology in space.

The shuttle system on those three legs -- the stool, if you will, on which they come out with three legs -- you kick one of them out and it is not going to sit very well. We need those military payloads in

order to make it economical.

What we do in space is -- from a military point of view -- is primarily and almost and exclusively primarily and exclusively the testing type systems -- fly reconnaissance satellies and we fly defense communications -- defense meteorological systems. They are, by and large, payloads which we would fly for anyone else if they wanted to fly. The shuttle is designed so it will add it adequately. It will fly them so we can revisit, repair on orbit or bring them back and repair on the earth.

As far as I am concerned they're just another customer. We treat it as a very valued customer, and if they want anything special, you can be sure I'll give it to them. On the other hand we don't intend to make the shuttle a military system.

I've heard and read a lot in the literature and press these days about there being blue shuttles and white shuttles. As far as I am concerned they're all completely white, but they'll be flown so as to meet the needs of all three classes of customers.

MR. : Could you tell us something about the charter operation of -- (inaudible) --

MR. : Basically, he'll run the transportation system at STS office, and will have

full responsibility for the development of shuttle until it gets to the point of operational capability. Jim Averson is well-known to me, and I worked with him when I was in industry.

He's an extremely competent person, and he has had much experience in developing large systems. He has, I believe, all of the talent and ability I need to bring that system up to operational capability.

If I had asked -- if I had been able to talk John Yardley into staying, I would have liked John to stay. If I could have found a man who had the appropriate program management experience in industry, I would have chosen that man instead of Averson, although I think we've got a very good man in him.

It's not too much different than what we have in Apollo -- (inaudible) was with NASA the first time and Sam Phillips was the Program Manager of the Apollo program. Sam was and is a very competent, experienced program manager.

He did a splendid job on Apollo and I think that was one of the reasons Apollo went on so well. I am confident that Averson will do the same thing with the shuttle.

He will have a big responsibility and will

report to me, and we're going over the next two years in the break-in period of shuttle, and it will require a lot of work.

We've got to make sure not only that it flies well and performs as advertised, but we've got to make sure that we meet the cost projection. We made that ten years ago, and that is a tough job. That is what Averson is going to do.

Yes?

Anyone? You up front.

MR. : (Inaudible) --

MR. : No, we haven't dropped all the possibilities -- there is one remaining that we might be able to do. We will be looking at that between now and the first of the year, trying to see if it is worth doing.

We're still trying to cost it out and see whether it can be done within the kind of budget that we have, but it is a very viable mission. It does have a cost -- results in a bit of a cost to some other things we'd like to do.

MR. : (Inaudible) --

MR. : Golly, we've been struggling for budget in NASA for the last ten years come Democrat or come Republican Administration. It has been done.

As I said when the shuttle was laid down in 1972 -- the 1972 budget, there was a moreless agreement that that buying power would be held constant during the period of development, and they didn't honor that for one year, let alone two.

It has been going down -- a struggle. It is not just the Administration, it is the Congress. I came back to Washington to do this job because I believe that it is an important thing to do -- very positive thing, and I think that this Administration has its heart in the right place as far as research and development are concerned.

You can hardly come into Washington, cut food stamps, welfare, and every other program in town and increase the budget of NASA. It is not a realistic thing. What I do believe is that if we can manage the program well, that in two or three years, we're going to be able to bring new starts into the program.

We'll see that trend start turning up, and that is my objective to run the program -- there are really three priorities as far as I am concerned. One is to get the shuttle to fly -- we started out to do that (inaudible) --

Second is during the next few years maintain that balance of the program -- not to lose the whole

area of our program and that means we've got to fight the budget. If I had my druthers I would dictate that policy today. That is the name of the game in Washington. If you go to Washington you've got to fight the budget. Just as simple as that -- either fight with the Administration and fight with Congress and you fight with people like Mr. Proxmire. The third part of it is that looking out over the next couple of years, when this great wealth of new interest in our programs -- this audience tonight is representative of that -- start to have its political affect that we're ready to go on to the next test.

The American people do think that way. Just to get to a point where we think they're finished and they start something else, and I very firmly believe that this country is not going to give up the kind of exploration we've been doing over the last couple of decades in the space program. Within a matter of a few years you'll see our budget turn up again, and I am looking forward to more resources. I would hope that out of Dr. Keeler's study, which is now on-going and he'll probably finish up in a year -- on space policy that we'll get a definition of the amount of resources that the country

ought to put into this kind of activity.

If I had my druthers, could dictate that policy today, I would say let's put about one percent of government expenditures -- the budget of the federal government this year is about $700 billion.

If we'd get one percent of that it would be $7 billion. It seems to me that is an appropriate amount to spend for the kind of advanced work we do. We could get that -- then I think we could be in very good shape and go along with that for the next few years.

Okay?

MR. : (Inaudible) --

MR. : I don't know but I have encouraged those folks who have been doing that kind of work down there. I would like to see over the long term the shuttle operated as a commercial vehicle, commercial transportation system, and if we could get to that point where we could turn it over to private enterprise or quasi-private kind of enterprise I'd be very happy.

If they could gobble up and raise the money privately, I'm all for it. It is the kind of thing that if bring the public in and they really put their money into it, then you really

would have a successful program. I think it would be great if we could do that. I think it is going to be difficult in the near term. --

My great dream is that that commercial experiment of McDonnell-Douglas and Johnson and Johnson will be an enormous commercial success. Nothing would please me more than if about five years the President or the Chairman of McDonnell-Douglas and Johnson and Johnson could come out in their statement to their stockholders and say, "Our profits this year were enormously enhanced by the money we made off of the continuous flow elected for use of experiments in space, which will then not be an experiment but a commercial reality, and we expect great things for the future". That would do more for the space program than anything I could think of. Now, how long are you willing to stay?

(Laughter.)

(End of side one.)

The probabilities are that to study policies statements that come out of this would not really be coming up before the Congress for the -- probably about a year, and that means the first time the Congress sees it will be in 1983 -- (inaudible)

I would hope to have something going by then -- the 1985 budget, but the policy statement will probably, I hope (inaudible) --

MR. : (Inaudible) --

MR. : Well, there are several bills up there -- the bill that has the most currency is the one with the -- sponsored by Jack Smith or Senator Smith, and that bill is drawn in a special -- in such a way as to provide, I think -- in fairly broad terms for anyone that wanted to come in and (inaudible) --

Where it stands -- twixt and between the two bodies -- the House had a bill and the Senate had a bill -- neither body has acted on their bills and they haven't even gotten to the point of having a conference on the bills.

My guess is that it is going to be at least another year before -- maybe more -- before you can get a bill that would allow (inaudible) --

The prospect of selling the landsat system is, I guess, moderately good or moderately bad, depending on -- the Comsat folks are putting some money into it and we've had a proposal to use their (Inaudible) --

So far I have not seen anything -- any

concrete proposal written down saying you made so much money -- taken over the system and have put so much money into it --

It wouldn't take much money to buy into it if someone wanted to do it. It would not be much in the nature of ground -- (inaudible) --

We've give them some designs and say "Hey, you have got a lot of -- (inaudible)"

How about one more? This young lady right here?

MS. : (Inaudible) --

MR. : Golly, (Inaudible) --

(Laughter.)

My European friends are awfully mad at me. They still talk to me. They are not so mad that they don't want us to do other things, but as you know we cancelled our spacecraft -- when I came into town it was cancelled.

We took a look at it to see if there was any way we could fit it into the budget and there was not, so I had to tell them that we didn't have any money to do it.

On the other hand I am told at the same time we would continue to honor our (inaudible) -- that was one of those programs which meant new

-- a new, new procedure which the Congress put in about a year or so again to have the national (inaudible) --

There was a great deal of hardware at that point, but we're now -- we put about an eight month hiatus into the program, and to get that going again, you are talking about $350 or $400 million. If nothing else we're satisifed -- the Europeans made a proposition to us that they would sell another satellite just like the one they had for about $40 million, which we could have afforded.

The Academy said no, that would be (Inaudible) -- we had to tell them we couldn't do it -- (Inaudible) --

One more?

MR. : (Inaudible) -- (Laughter.)

MR. : That is -- someone asked me that question earlier today, and I said that was like trying to decide which one of your children to give away. I don't know. I really don't. We are not at that point yet.

I really find that very hard. All I can tell you is that from the programmatic point of view, that we've got to finish shuttle -- three programs -- aeronautics, space science, exploration -- navigation. I don't know which one. I cry a lot, but --

Thank you.

(Applause.)

(End of question portion of speech.)